

## 4.2

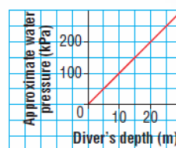
### Linear Relations

#### LESSON 3

#### Connect

Diver's Depth (m)	Approximate Water Pressure (kiloPascals)
0	0
5	50
10	100
15	150
20	200

Pressure on a Diver



When a scuba diver goes under water, the weight of the water exerts pressure on the diver.

$$\frac{\Delta y}{\Delta x} = \frac{50}{5} = 10$$

What pattern do you see in the table and in the graph? As the diver goes down by 5 in the pressure increases by 50.

What do these patterns tell you about the relationship between depth and water pressure?

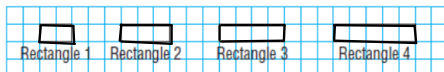
Linear Relation.

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#### Connect

The first 4 rectangles in a pattern are shown below. The pattern continues. Each small square has side length 1 cm.



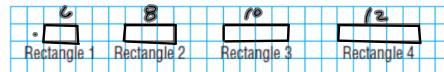
The perimeter of a rectangle is related to the rectangle number.

We can use the following to represent this relationship:

- 1) words
- 2) a table
- 3) a graph
- 4) an equation

#### Connect

The first 4 rectangles in a pattern are shown below. The pattern continues. Each small square has side length 1 cm.



IN WORDS: Each rectangle increases the perimeter by 2

As the rectangle # increases by 1, the perimeter increases by 2

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### Connect

The first 4 rectangles in a pattern are shown below. The pattern continues. Each small square has side length 1 cm.

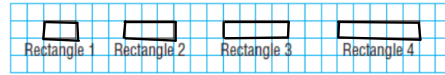


In a table:

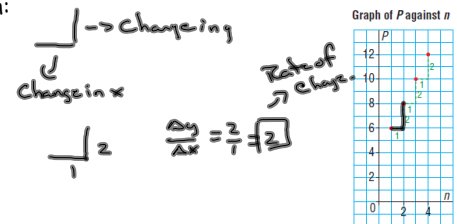
Rectangle Number, n	Perimeter P (cm)
1	6
2	8
3	10
4	12

### Connect

The first 4 rectangles in a pattern are shown below. The pattern continues. Each small square has side length 1 cm.



In a graph:

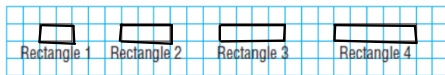


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### Connect

The first 4 rectangles in a pattern are shown below. The pattern continues. Each small square has side length 1 cm.



In an equation:

Rate of Change = 2  
Constant = 4  
Dependent V = Perimeter  
Independent V = Rectangle #

$$P = 2r + 4$$

### Connect

Terminology:

Dependent Variable - a variable whose value is determined by the value of another (the independent) variable

Independent Variable - a variable whose value is not determined by the value of another variable, and whose value determines the value of another (the dependent) variable.

Relation - a rule that relates to 2 quantities.

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### Connect

#### Terminology:

#### LINEAR RELATION:

When the graph of the relation is a straight line, we have a linear relation. In a linear relation, a constant change in one quantity produces a constant change in the related quantity.

$$\begin{array}{r|l} x & y \\ \hline 1 & 0 \\ 1 & 1 \\ 1 & 2 \\ 1 & 3 \end{array} \quad \begin{array}{l} 2 \\ 4 \\ 6 \\ 8 \end{array}$$

### Connect

#### EXAMPLE 1:

The table of values shows the cost of renting DVD's at an online store.

# of DVDs Rented	Cost, C(\$)
1	3.50
2	7.00
3	10.50
4	14.00
5	17.50

a) Graph the data. Does it make sense to join the points on the graph?

b) Is the relation linear?

c) Use the table to describe the pattern in the rental costs. How is this pattern shown in the graph?

*Equation.*

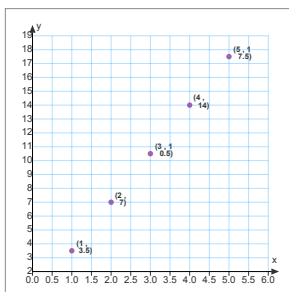
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### Connect

#### EXAMPLE 1:

a) Graph the data. Does it make sense to join the points on the graph?

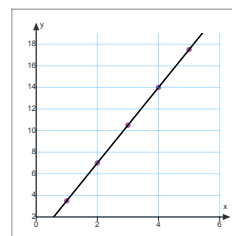


# of DVDs Rented	Cost
1	3.5
2	7
3	10.5
4	14
5	17.5

### Connect

#### EXAMPLE 1:

b) Is the relation linear?



# of DVDs Rented	Cost
1	3.5
2	7
3	10.5
4	14
5	17.5

*Straight Line  
↳ linear*

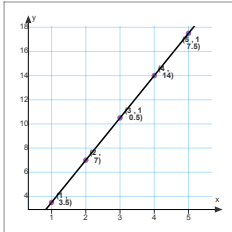
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### Connect

### EXAMPLE 1:

c) Use the table to describe the pattern in the rental costs.  
How is this pattern shown in the graph?



# of DVDs Rented	Cost
1	3.5
2	7
3	10.5
4	14
5	17.5

$$C = 3.5d$$

### Discuss the ideas

1) How do you know whether a graph represents a linear relation?

*Straight line*

*constant change with both variables*

2) How do you know whether a table of values represents a linear relation?

$$\begin{array}{r|l} x & y \\ \hline 1 & 5 \\ 2 & 10 \\ 3 & 15 \end{array}$$

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### Practice

### CLASSWORK

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